Alabama Department of Environmental Management

Final

Total Maximum Daily Load (TMDL)

for the

Cowarts Creek Watershed

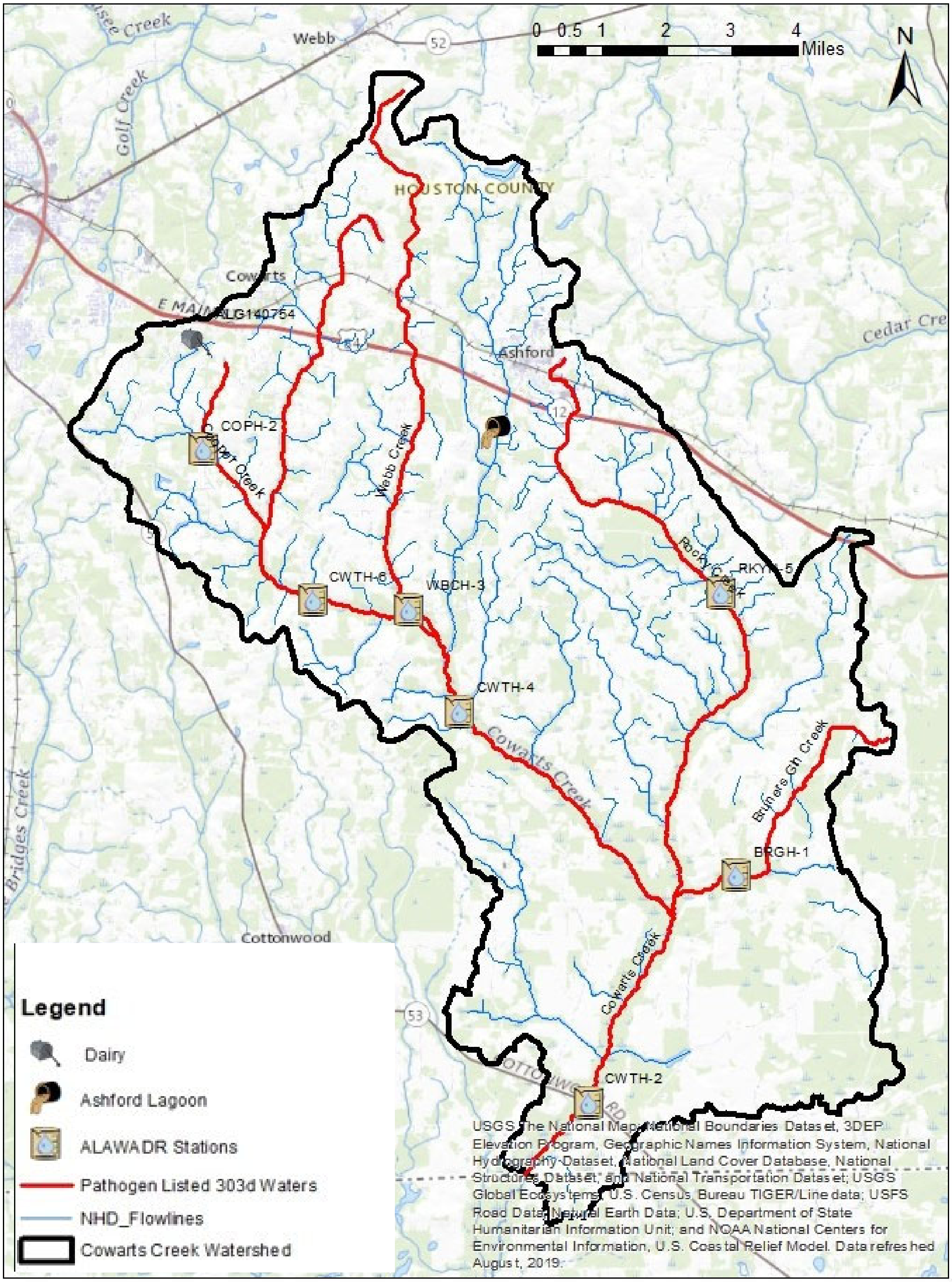
Assessment Unit IDs:
AL03130012-0203-110 (Cowarts Creek)
AL03130012-0202-210 (Bruners Gin Creek)
AL03130012-0202-100 (Rocky Creek)
AL03130012-0201-410 (Cooper Creek)
AL03130012-0201-310 (Webb Creek)

Houston County

Pathogens (*E. coli*)

Alabama Department of Environmental Management
Water Quality Branch
Water Division
August 2023

Figure 1: Cowarts Creek Watershed



Contents

1.0 Executive Summary

Section 303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify waterbodies which are not meeting their designated uses and to determine the total maximum daily load (TMDL) for pollutants causing the use impairment. A TMDL is the sum of individual wasteload allocations for point sources (WLAs), load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS).

Cowarts Creek forms in Houston County and is part of the Chipola River basin. It begins north of Avon, Alabama and flows south for approximately 21.72 miles until it crosses the Florida state line. Cooper Creek, Rocky Creek, and Webb Creek are tributaries to Cowarts Creek, and Bruners Gin Creek is a tributary to Rocky Creek. The total drainage area for the Cowarts Creek watershed in Alabama is approximately 105 square miles. The use classification for Cowarts Creek and the aforementioned tributaries is Fish & Wildlife.

The §303(d) listing for Cowarts Creek was originally reported on Alabama's 2016 List of Impaired Waters based on data collected in 2014. Since the listed segment of Cowarts Creek extends from the Alabama-Florida state line to its source, this TMDL will apply only to the Alabama portion of the Cowarts Creek watershed.

The §303(d) listing for Bruners Gin Creek was originally reported on Alabama's 2018 List of Impaired Waters based on data collected in 2015. The §303(d) listings for Rocky Creek and Webb Creek were originally reported on Alabama's 2020 List of Impaired Waters based on data collected in 2018. The §303(d) listing for Cooper Creek was originally reported on Alabama's 2020 List of Impaired Waters based on data collected in 2017. (Cooper Creek is also listed as impaired for nutrients and organic enrichment (BOD); this TMDL only addresses the pathogens impairment.)

Between 2015 and 2022, ADEM collected water quality data for the Cowarts Creek watershed at seven stations on the impaired segments. According to the data collected, these waterbodies were not meeting the pathogen criteria applicable to their use classification of Fish and Wildlife. The January 2022 edition of *Alabama's Water Quality Assessment and Listing Methodology*, prepared by ADEM, provides the rationale for the Department to use the most recent data to prepare a TMDL for an impaired waterbody.

A mass balance approach was used for calculating the pathogen TMDLs for the Cowarts Creek watershed. The mass balance approach utilizes the conservation of mass principle. The TMDL was calculated using the single sample or geometric mean sample exceedance event which resulted in the highest percent reduction. Existing loads were calculated by multiplying the *E. coli* concentrations times the respective in-stream flows and a conversion factor. In the same manner as existing loads were calculated, allowable loads were calculated for the single sample *E. coli* target of 268.2 colonies/100 ml (235 colonies/100 ml – 10% Margin of Safety) and geometric mean *E. coli* target of 113.4 colonies/100 ml (126 colonies/100 ml – 10% Margin of Safety).

Tables 1-5 are summaries of the estimated existing loads, allowable loads, and percent reductions for each waterbody. Tables 6-10 list the TMDLs, defined as the maximum allowable *E. coli* loadings under critical conditions, for each waterbody.

Table 1: *E. coli* Loads and Required Reductions for Cowarts Creek

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	9.81E+12	8.47E+11	8.96E+12	91%
Geometric Mean Load	1.42E+12	2.22E+11	1.20E+12	84%
Ashford WWTP	1.68E+8	3.96E+9	0	0%

Table 2: *E. coli* Loads and Required Reductions for Bruners Gin Creek

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	4.86E+10	1.25E+10	3.62E+10	74%

Table 3: *E. coli* Loads and Required Reductions for Rocky Creek

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	1.45E+11	3.48E+10	1.10E+11	76%

Table 4: *E. coli* Loads and Required Reductions for Cooper Creek

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	2.02E+12	7.87E+9	2.01E+12	100%

Table 5: *E. coli* Loads and Required Reductions for Webb Creek

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	4.44E+10	1.84E+10	2.61E+10	59%

Table 6: *E. coli* TMDL for Cowarts Creek

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
9.41E+11	9.41E+10	3.96E+9	91%	0	8.43E+11	91%

a. Current and future CAFOs will be assigned a wasteload allocation (WLA) of zero.
b. Current and future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. MS4 permits are BMP-based and currently do not specify numeric *E. coli* limits. TMDL compliance will be demonstrated through implementation and maintenance of BMPs. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.
e. TMDL was established using the single sample *E. coli* criterion of 298 colonies/100ml.

Table 7: *E. coli* TMDL for Bruners Gin Creek

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
1.39E+10	1.39E+9	0	0%	0	1.25E+10	74%

a. Current and future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. Current and future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. MS4 permits are BMP-based and currently do not specify numeric *E. coli* limits. TMDL compliance will be demonstrated through implementation and maintenance of BMPs. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.
e. TMDL was established using the single sample *E. coli* criterion of 298 colonies/100ml.

Table 8: *E. coli* TMDL for Rocky Creek

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]				Load Allocation (LA)	
		WWTPs[b]	MS4s[c]		Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
3.86E+10	3.86E+9	0		0%	0	3.48E+10	76%

a. Current and future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. Current and future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. MS4 permits are BMP-based and currently do not specify numeric *E. coli* limits. TMDL compliance will be demonstrated through implementation and maintenance of BMPs. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.
e. TMDL was established using the single sample *E. coli* criterion of 298 colonies/100ml.

Table 9: *E. coli* TMDL for Cooper Creek

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]				Load Allocation (LA)	
		WWTPs[b]	MS4s[c]		Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
8.75E+9	8.75E+8	0		100%	0	7.87E+9	100%

a. Current and future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. Current and future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. MS4 permits are BMP-based and currently do not specify numeric *E. coli* limits. TMDL compliance will be demonstrated through implementation and maintenance of BMPs. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.
e. TMDL was established using the single sample *E. coli* criterion of 298 colonies/100ml.

Table 10: *E. coli* TMDL for Webb Creek

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]				Load Allocation (LA)	
		WWTPs[b]	MS4s[c]		Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
2.04E+10	2.04E+9	0		0%	0	1.84E+10	59%

a. Current and future CAFOs will be assigned a waste load allocation (WLA) of zero.
b. Current and future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. MS4 permits are BMP-based and currently do not specify numeric *E. coli* limits. TMDL compliance will be demonstrated through implementation and maintenance of BMPs. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.
e. TMDL was established using the single sample *E. coli* criterion of 298 colonies/100ml.

Compliance with the terms and conditions of existing and future NPDES permits will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL. Required load reductions in the LA portion of this TMDL can be implemented through voluntary measures and may be eligible for CWA §319 grants.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria and we are committed towards targeting the load reductions to improve water quality in the Cowarts Creek watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL accordingly.

2.0 Basis for §303(d) Listing

2.1 Introduction

Section 303(d) of the Clean Water Act and EPA's Water Quality Planning and Management Regulations (40 CFR Part 130) require states to identify waterbodies which are not meeting their designated uses and to determine the total maximum daily load (TMDL) for pollutants causing use impairment. The TMDL process establishes the allowable loading of pollutants for a waterbody based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water-quality based controls to reduce pollution and restore and maintain the quality of their water resources (USEPA, 1991).

The State of Alabama has identified five segments within the Cowarts Creek watershed as impaired for pathogens: AL03130012-0203-110 (Cowarts Creek), AL03130012-0202-210, (Bruners Gin Creek), AL03130012-0202-100 (Rocky Creek), AL03130012-0201-410 (Cooper Creek), and AL03130012-0201-310 (Webb Creek).

The §303(d) listing for Cowarts Creek was originally reported on Alabama's 2016 List of Impaired Waters based on data collected in 2014 and was included on all subsequent lists. The sources of the impairment on the 2022 §303(d) list are animal feeding operations, municipal, and pasture grazing.

The §303(d) listing for Bruners Gin Creek was originally reported on Alabama's 2018 List of Impaired Waters based on data collected in 2015 and was included on all subsequent lists. The source of the impairment on the 2022 §303(d) list is pasture grazing.

The §303(d) listing for Rocky Creek was originally reported on Alabama's 2020 List of Impaired Waters based on data collected in 2018 and was included on all subsequent lists. The source of the impairment on the 2022 §303(d) list is pasture grazing.

The §303(d) listing for Cooper Creek was originally reported on Alabama's 2020 List of Impaired Waters based on data collected in 2017 and was included on all subsequent lists. The sources of the impairment on the 2022 §303(d) list are animal feeding operations and pasture grazing.

The §303(d) listing for Webb Creek was originally reported on Alabama's 2020 List of Impaired Waters based on data collected in 2018 and was included on all subsequent lists. The sources of the impairment on the 2022 §303(d) list are collection system failure and pasture grazing.

2.2 Problem Definition

Waterbodies Impaired:	Cowarts Creek – from the AL-FL state line to its source Bruners Gin Creek – from Rocky Creek to its source Rocky Creek – from Cowarts Creek to its source Cooper Creek – from Cowarts Creek to its source Webb Creek – from Cowarts Creek to its source
Impaired Reach Lengths:	Cowarts Creek – 21.72 miles Bruners Gin Creek – 5.43 miles Rocky Creek – 11.70 miles Cooper Creek – 3.13 miles Webb Creek – 10.22 miles
Impaired Drainage Area:	105.1 square miles
Water Quality Standard Violation:	Pathogens
Pollutant of Concern:	Pathogens (*E. coli*)
Water Use Classification:	Fish and Wildlife

Usage Related to Classification:
The impaired stream segments are classified as Fish and Wildlife (F&W). Usage of waters in the F&W classification is described in ADEM Admin. Code R. 335-6-10-.09(5)(a), (b), (c), and (d).

> *(a) Best usage of waters: fishing, propagation of fish, aquatic life, and wildlife.*
>
> *(b) Conditions related to best usage: the waters will be suitable for fish, aquatic life and wildlife propagation. The quality of salt and estuarine waters to which this classification is assigned will also be suitable for the propagation of shrimp and crabs.*
>
> *(c) Other usage of waters: it is recognized that the waters may be used for incidental water contact year-round and whole body water-contact recreation during the months of May through October, except that water contact is strongly discouraged in the vicinity of discharges or other conditions beyond the control of the Department or the Alabama Department of Public Health.*

(d) Conditions related to other usage: the waters, under proper sanitary supervision by the controlling health authorities, will meet accepted standards of water quality for outdoor swimming areas and will be considered satisfactory for swimming and other whole body water-contact sports.

E. coli Criteria:
Criteria for acceptable bacteria levels for the F&W classification are described in ADEM Admin. Code R. 335-6-10-.09(5)(e)7(i) and (ii) as follows:

Bacteria:

(i) In non-coastal waters, bacteria of the E. coli group shall not exceed a geometric mean of 548 colonies/100 ml; nor exceed a maximum of 2,507 colonies/100 ml in any sample. In coastal waters, bacteria of the enterococci group shall not exceed a maximum of 275 colonies/100 ml in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours.

(ii) For incidental water contact and whole body water-contact recreation during the months of May through October, the bacterial quality of water is acceptable when a sanitary survey by the controlling health authorities reveals no source of dangerous pollution and when the geometric mean E. coli organism density does not exceed 126 colonies/100 ml nor exceed a maximum of 298 colonies/100 ml in any sample in non-coastal waters. In coastal waters, bacteria of the enterococci group shall not exceed a geometric mean of 35 colonies/100 ml nor exceed a maximum of 158 colonies/100 ml in any sample. The geometric mean shall be calculated from no less than five samples collected at a given station over a 30-day period at intervals not less than 24 hours. When the geometric bacterial coliform organism density exceeds these levels, the bacterial water quality shall be considered acceptable only if a second detailed sanitary survey and evaluation discloses no significant public health risk in the use of the waters. Waters in the immediate vicinity of discharges of sewage or other wastes likely to contain bacteria harmful to humans, regardless of the degree of treatment afforded these wastes, are not acceptable for swimming or other whole body water-contact sports.

Criteria Exceeded:
Cowarts Creek was added to the §303(d) list in 2016 based on data collected in 2014. Data from 2014 showed that the *E. coli* criterion was exceeded in three out of eight samples at ADEM stations CWTH-4 and CWTH-6 and in two out of eight samples at ADEM station CWTH-5. (These exceedances were based on the *E. coli* criteria in place in 2016; however, the *E. coli* criteria were revised in 2017. Based on the new criteria, there were exceedances in four out of eight samples at stations CWTH-4 and CWTH-5 and in five out of eight samples at station CWTH-6.)

Bruners Gin Creek was added to the §303(d) list in 2018 based on data collected in 2015. Data from 2015 at ADEM station BRGH-1 showed that the *E. coli* criterion was exceeded in three out of eight samples.

Rocky Creek was added to the §303(d) list in 2020 based on data collected in 2018. Data from 2018 at ADEM station RKYH-5 showed that the *E. coli* criterion was exceeded in two out of eight samples.

Cooper Creek was added to the §303(d) list in 2020 based on data collected in 2017. Data from 2017 at ADEM station COPH-2 showed that the *E. coli* criterion was exceeded in six out of eight samples.

Webb Creek was added to the §303(d) list in 2020 based on data collected in 2018. Data from 2018 at ADEM station WBCH-3 showed that the *E. coli* criterion was exceeded in three out of eight samples.

The listing data is summarized in Appendix 7.2.

3.0 Technical Basis for TMDL Development

3.1 Water Quality Target Identification

For the purpose of this TMDL, a single sample maximum *E. coli* target of 268.2 colonies/100 ml will be used. This target was derived by using a 10% explicit margin of safety from the single sample maximum criterion of 298 colonies/100 ml. This target is considered protective of water quality standards and should not allow the single sample maximum of 298 colonies/100 ml to be exceeded. In addition, a geometric mean target of 113.4 colonies/100 ml will be used for a series of five samples taken at least 24 hours apart over the course of 30 days. This target was also derived by using a 10% explicit margin of safety from the geometric mean criterion of 126 colonies/100 ml. This target is considered protective of water quality standards and should not allow the geometric mean criterion to be exceeded.

3.2 Source Assessment

3.2.1 Point Sources in the Cowarts Creek Watershed

A point source can be defined as a discernible, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. Point source contributions can typically be attributed to municipal wastewater facilities, illicit discharges, and leaking sewer systems in urban areas. Municipal wastewater treatment facilities are permitted through the National Pollutant Discharge Elimination System (NPDES) process administered by ADEM. In urban settings, sewer lines typically run parallel to streams in the floodplain. If a leaking sewer line is present, high concentrations of bacteria can flow into the stream or leach into the groundwater. Illicit discharges are found at facilities that are discharging bacteria when not permitted, or when the pathogens criterion established in the issued NPDES permit is not being upheld.

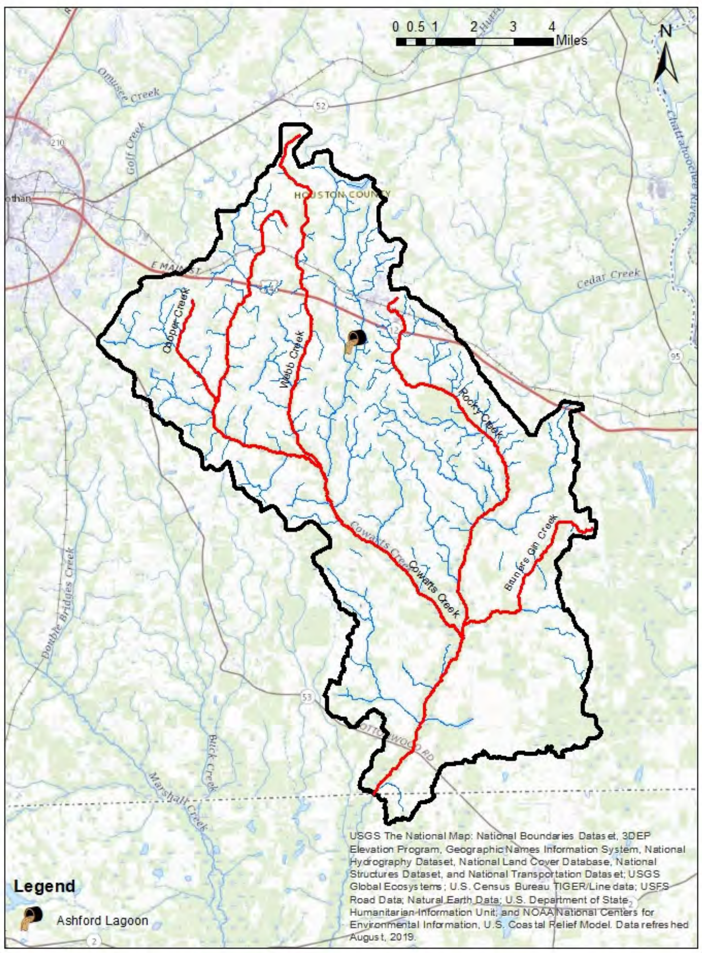
Continuous Point Sources

There is currently one NPDES-regulated continuous point source in the Cowarts Creek watershed. The Ashford WWTP (AL0057878) discharges to Mill Creek, which is a tributary to Cowarts Creek. The current permit limits for this facility are the applicable pathogen criteria for the Fish and Wildlife use classification and are as follows:

Monthly average (May-October): 126 colonies/100ml
Monthly average (November-April): 548 colonies/100ml
Daily maximum (May-October): 298 colonies/100ml
Daily maximum (November-April): 2507 colonies/100ml

Any future NPDES-regulated continuous discharges that are considered by the Department to be a pathogen source will be required to meet the in-stream water quality criteria for pathogens at the point of discharge.

Figure 2: Location of Ashford WWTP



Non-Continuous Point Sources

Urban areas designated as part of the Municipal Separate Storm Sewer System (MS4) program are regulated by NPDES, and as such, are considered to be point sources by EPA and receive waste load allocations (WLAs) in TMDLs. Currently, there is a small portion of the Phase II Dothan MS4 area (ALR040007) that drains directly to the upper portion of the Cowarts Creek watershed. Future MS4s will be required to demonstrate consistency with the assumptions and requirements of this TMDL.

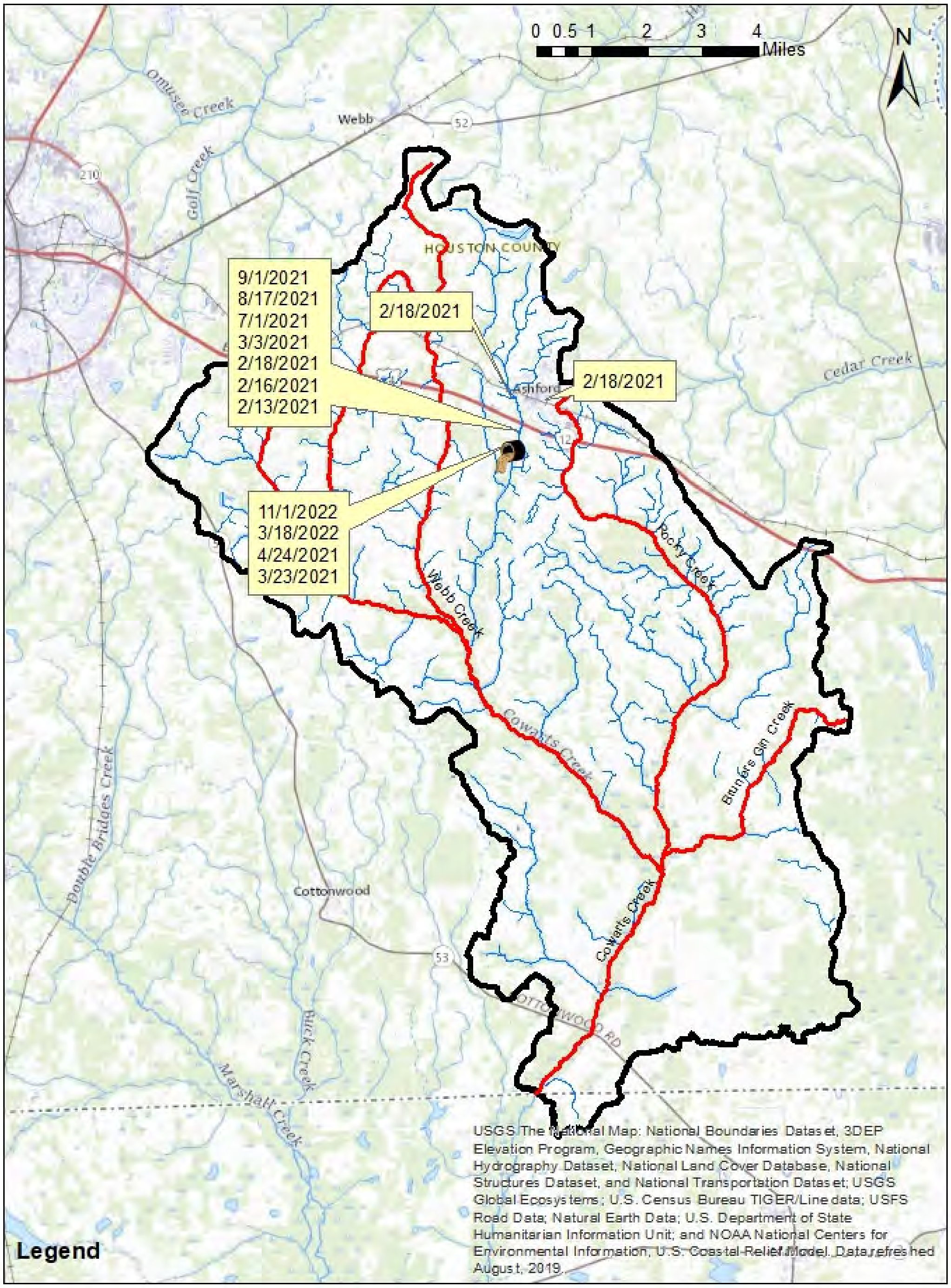
The Cowarts Creek watershed contains two Concentrated Animal Feeding Operations (CAFOs) or Voluntary Animal Feeding Operations (AFOs). One is a dairy located in the Cooper Creek subwatershed. The other is a pullet producer located within the Rocky Creek subwatershed. AFOs/CAFOs are required to implement and maintain effective best management practices (BMPs) that meet or exceed Natural Resources Conservation Service (NRCS) technical standards and guidelines, and the ADEM AFO/CAFO rules currently prohibit point source discharges of pollutants from these facilities and their associated land application activities. As a result, current and future AFOs/CAFOs will receive a waste load allocation of zero.

Based on a review of the Department's records, the dairy CAFO in the Cooper Creek watershed appears to be a significant contributor to the pathogens impairment in Cooper Creek. Since ADEM's rules prohibit point source discharges from CAFOs, the facility will not be given an allocation in this TMDL; however, ensuring appropriate BMPs are in place and being properly maintained at the dairy facility will possibly result in reductions in the *E. coli* concentrations in Cooper Creek.

Sanitary sewer overflows (SSOs) have the potential to severely impact water quality and can often result in the violation of water quality standards. It is the responsibility of the NPDES wastewater discharger or collection system operator for non-permitted "collection only" systems to ensure that releases do not occur. Unfortunately, releases to surface waters from SSOs are not always preventable or reported.

From review of ADEM files, it was found that numerous SSOs have been reported in the watershed in recent years. During 2021-2022, there were thirteen SSOs related to the Ashford WWTP reported in the Cowarts Creek watershed. A map showing the locations of the 2021-2022 SSOs in the watershed is included below. Reports of the SSOs in the watershed are included in Appendix 7.3.

Figure 3: Cowarts Creek Watershed SSO Map



3.2.2 Nonpoint Sources in the Cowarts Creek Watershed

Nonpoint sources of bacteria do not have a defined discharge point but rather occur over the entire length of a stream or waterbody. On the land surface, bacteria can accumulate over time and be washed into streams or waterbodies during rain events. Therefore, there is some net loading of bacteria into streams as dictated by the watershed hydrology.

Land use in this watershed is primarily agricultural. Approximate land use proportions for the Cowarts Creek watershed are 53% agricultural and 13% forested, with the remaining 34% further delineated below.

Agricultural land can be a source of *E. coli* bacteria. Runoff from pastures, animal feeding areas, improper land application of animal wastes, and animals with direct access to streams are all mechanisms that can contribute bacteria to waterbodies.

E. coli bacteria can also originate from forested areas due to the presence of wild animals such as deer, raccoons, turkey, waterfowl, etc. Wildlife will deposit feces onto land surfaces, where it can be transported during rainfall events to nearby streams. Control of these sources is usually limited to land management BMPs and may be impracticable in most cases. As a result, forested areas are not specifically targeted in this TMDL.

E. coli loading from developed areas is potentially attributable to multiple sources including storm water runoff, unpermitted discharges of wastewater, runoff from improper disposal of waste materials, failing septic tanks, and domestic animals. On-site septic systems may be direct or indirect sources of bacterial pollution via ground and surface waters due to system failures and malfunctions.

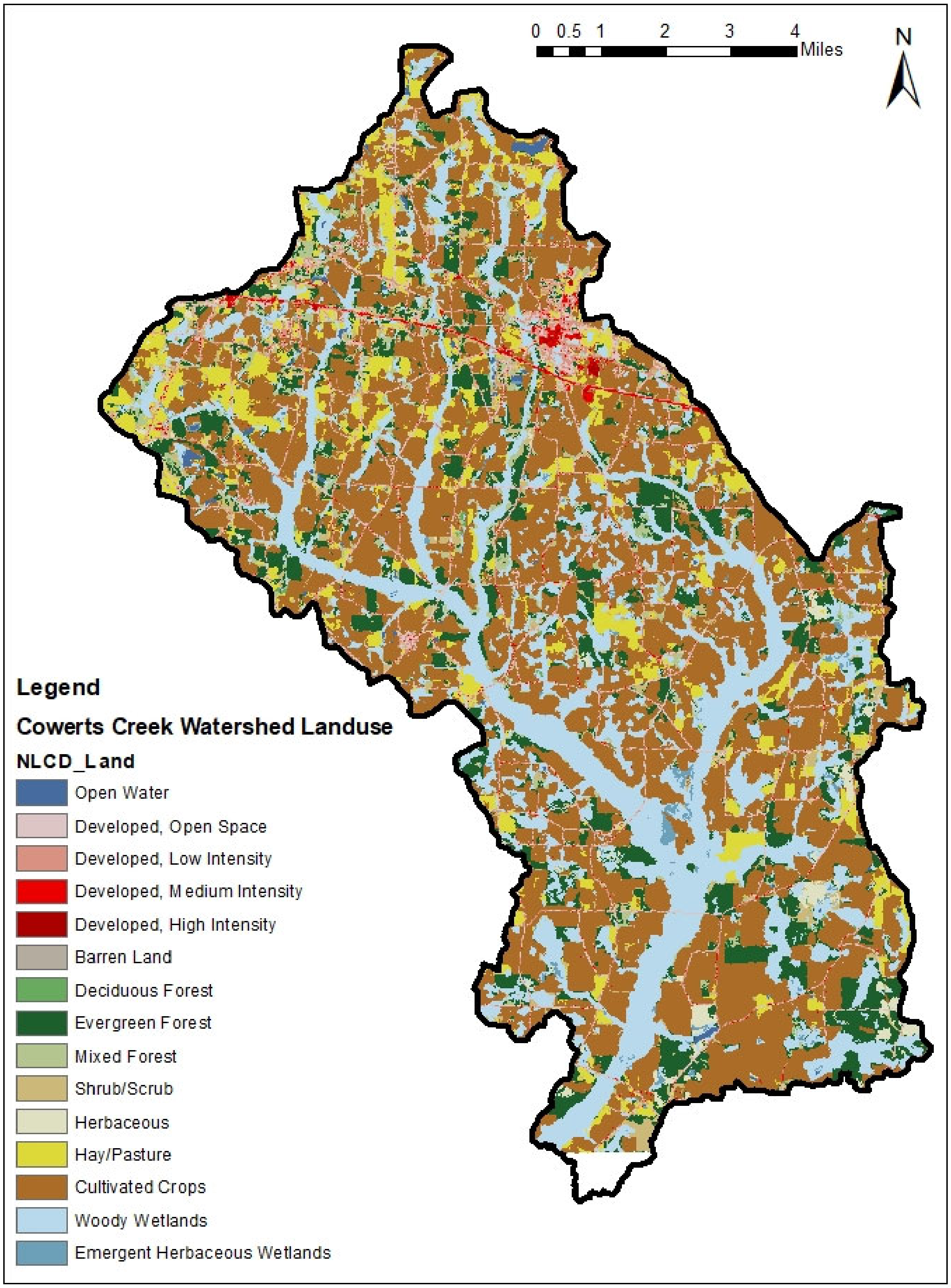
3.3 Land Use Assessment

Land use for the Cowarts Creek watershed was determined using ArcMap with land use datasets derived from the 2019 National Land Cover Dataset (NLCD). Table 11 depicts the primary land uses in the Cowarts Creek watershed. Figure 4 displays the land use areas for the Cowarts Creek watershed.

Table 11: Land Use in the Cowarts Creek Watershed

Land Use	Miles ^2	Acres	Percent
Open Water	0.46	295.4	0.44%
Developed, Open Space	4.27	2736.2	4.07%
Developed, Low Intensity	2.91	1861.2	2.77%
Developed, Medium Intensity	0.82	524.2	0.78%
Developed, High Intensity	0.12	77.6	0.12%
Barren Land	0.01	8.9	0.01%
Deciduous Forest	0.24	154.1	0.23%
Evergreen Forest	11.25	7202.2	10.71%
Mixed Forest	2.41	1543.8	2.30%
Shrub/Scrub	3.31	2121.7	3.16%
Herbaceous	1.14	730.8	1.09%
Hay/Pasture	8.58	5493.1	8.17%
Cultivated Crops	46.76	29931.4	44.52%
Woody Wetlands	22.02	14095.6	20.96%
Emergent Herbaceous Wetlands	0.72	461.5	0.69%
Class Description			
Developed	8.12	5199.1	7.73%
Forest	13.91	8900.1	13.24%
Agriculture	55.35	35424.5	52.69%
Other	27.68	17713.9	26.35%

Figure 4: Land Use in the Cowarts Creek Watershed



3.4 Linkage between Numeric Targets and Sources

The primary land uses in the Cowarts Creek watershed are agriculture and forested/natural, followed by developed land. Pollutant loadings from forested areas tend to be low due to their filtering capabilities and will be considered as background conditions. The most likely sources of pathogen loadings in the Cowarts Creek watershed are agricultural runoff and sanitary sewer system failures. Pollutant loadings from the agricultural land uses are likely contributing to the pathogen impairment. It is not considered a logical approach to calculate individual components for nonpoint source loadings. Hence, there will not be individual loads or reductions calculated for the various nonpoint sources. The loadings and reductions will only be calculated as a single total nonpoint source load and reduction.

3.5 Data Availability and Analysis

Between 2015 and 2022, ADEM collected water quality data for the Cowarts Creek watershed at seven stations on the impaired waterbodies. The station locations are shown below in Table 14 and a map showing the station locations can be seen in Figure 1. There were exceedances of the summer single sample maximum criterion of 298 col/100 ml at each station. In addition, intensive bacteria studies were conducted at stations CWTH-2 and CWTH-4 during May/June 2021 and August/September 2021. Each intensive bacteria study consisted of collecting at least five *E. coli* bacteria samples over a 30-day time window, with a minimum of 24 hours between each sample collection. A geometric mean was calculated from each intensive bacteria study. Each of the calculated geometric means exceeded the geometric mean criterion of 126 col/100 ml. The *E. coli* data is shown below in Tables 13-16. All *E. coli* criteria exceedances are highlighted in red.

Table 12: Stations Sampled in the Cowarts Creek Watershed

Station	Latitude	Longitude	Station Description
CWTH-2	31.01695	-85.2231	Cowarts Ck at Houston Co Rd 53 intersect
CWTH-4	31.10531	-85.255	Cowarts Creek at Houston CR 55
CWTH-6	31.13084	-85.2925	Cowarts Creek at Edgar Smith Rd
BRGH-1	31.06738	-85.1837	Bruners Gin Ck at Houston CR 75
RKYH-5	31.1311	-85.1864	Rocky Creek at Creek Church Road
COPH-2	31.16509	-85.3205	Cooper Creek at Sanitary Dairy Road
WCBH-3	31.12844	-85.2675	Webb Creek at Lucy Grade Rd.

Table 13: ADEM Water Quality Data for Cowarts Creek

Station	Date	Flow cfs*	E. coli mpn/dl	Laboratory Codes**
CWTH-2	3/30/2021	217.6	344.8	
CWTH-2	4/15/2021	400.1	186	
CWTH-2	5/13/2021	263.8	770.1	
CWTH-2	6/1/2021	125.5	93.4	
CWTH-2	6/2/2021	125.5	115.3	
CWTH-2	6/3/2021	115.8	104.3	
CWTH-2	6/8/2021	150.6	1119.9	
CWTH-2	7/8/2021	184.2	579.4	
CWTH-2	8/9/2021	307.8	248.1	
CWTH-2	8/11/2021	120.0	156.5	
CWTH-2	8/12/2021	107.1	613.1	
CWTH-2	8/18/2021	103.8	345	
CWTH-2	9/1/2021	307.8	419.6	
CWTH-2	10/14/2021	303.4	146.7	
CWTH-4	3/30/2021	92.6	2419.6	
CWTH-4	4/15/2021	170.2	770.1	
CWTH-4	5/13/2021	112.2	721.5	
CWTH-4	6/1/2021	53.4	120.1	
CWTH-4	6/2/2021	53.4	141.4	
CWTH-4	6/3/2021	49.3	101.7	
CWTH-4	6/8/2021	64.1	2419.6	G
CWTH-4	6/10/2021	78.4	488.4	
CWTH-4	7/8/2021	130.9	1413.6	
CWTH-4	8/9/2021	51.1	275.5	
CWTH-4	8/11/2021	45.6	461.1	
CWTH-4	8/12/2021	44.1	727	
CWTH-4	8/18/2021	130.9	689.6	
CWTH-4	9/1/2021	129.1	3106.2	
CWTH-4	10/14/2021	91.4	178.5	
CWTH-6	3/30/2021	30.3	2419.6	G
CWTH-6	4/15/2021	72.6	1299.7	
CWTH-6	5/13/2021	47.8	1203.3	
CWTH-6	6/8/2021	27.3	2419.6	G
CWTH-6	7/8/2021	55.8	1413.6	
CWTH-6	8/11/2021	19.4	290.9	
CWTH-6	10/14/2021	39.0	290.9	

*Flows highlighted in yellow were estimated by taking the average daily flow from USGS Gauge 02358789 for the sampling date and multiplying by the ratio of the sampling station/gauge drainage area.
**G indicates that the actual number was probably greater than the number reported.

Table 14: ADEM Water Quality Data for Bruners Gin Creek and Rocky Creek

Station	Date	Flow cfs*	E. coli mpn/dl	Laboratory Codes**
BRGH-1	3/19/2015	4.7	365.4	
BRGH-1	4/9/2015	4.7	172.3	
BRGH-1	5/6/2015	6.7	90.9	
BRGH-1	6/11/2015	5.6	131.4	
BRGH-1	7/1/2015	6.8	435.2	
BRGH-1	8/6/2015	3.1	547.5	
BRGH-1	9/9/2015	1.9	1046.2	
BRGH-1	10/7/2015	6.3	275.5	
RKYH-5	3/6/2018	19.9	2419.6	GH
RKYH-5	4/9/2018	6.1	197.3	H
RKYH-5	5/15/2018	2.4	156.5	H
RKYH-5	6/5/2018	8.2	435.2	H
RKYH-5	7/11/2018	3.9	172.5	
RKYH-5	8/1/2018	5.3	1119.9	H
RKYH-5	9/5/2018	5.7	216.2	
RKYH-5	10/9/2018	2.3	172.2	

*Flows highlighted in yellow were estimated by taking the average daily flow from USGS Gauge 02358789 for the sampling date and multiplying by the ratio of the sampling station/gauge drainage area.
**G indicates that the actual number was probably greater than the number reported. H indicates that the analytical holding times for analysis were exceeded.

The water quality data collected in the Bruners Gin Creek watershed during 2015 (illustrated in the table above) reflects the most recent data available. The Department believes that this data is still representative of current conditions since there have been minimal changes in the predominant land use coverages contributing to the pathogens impairment in this watershed since 2015.

Table 15: ADEM Water Quality Data for Cooper Creek and Webb Creek

Station	Date	Flow cfs*	E. coli mpn/dl	Laboratory Codes**
COPH-2	3/15/2017	3.8	2419.6	GH
COPH-2	4/11/2017	2.8	127.4	H
COPH-2	5/1/2017	1.2	68670	H
COPH-2	6/7/2017	1.7	64880	H
COPH-2	7/5/2017	1.8	4839.2	GH
COPH-2	8/16/2017	11.9	32550	H
COPH-2	9/13/2017	6.3	20982	H
COPH-2	10/10/2017	2.4	20142	H
COPH-2	3/16/2022	3.9	2419.6	G
COPH-2	4/14/2022	3	2419.6	G
COPH-2	5/11/2022	1.3	2419.6	G
COPH-2	6/16/2022	0.9	2419.6	G
COPH-2	7/13/2022	5.3	2419.6	G
COPH-2	9/8/2022	1	2419.6	G
WBCH-3	3/6/2018	15.0	2419.6	GH
WBCH-3	4/9/2018	14.4	251.8	H
WBCH-3	5/15/2018	7.3	387.3	H
WBCH-3	6/5/2018	8.4	127.4	H
WBCH-3	7/11/2018	2.7	260.3	
WBCH-3	8/1/2018	2.8	648.8	H
WBCH-3	9/5/2018	4.9	300	
WBCH-3	10/9/2018	0.3	172.3	

*Flows highlighted in yellow were estimated by taking the average daily flow from USGS Gauge 02358789 for the sampling date and multiplying by the ratio of the sampling station/gauge drainage area.

**G indicates that the actual number was probably greater than the number reported. H indicates that the analytical holding times for analysis were exceeded.

Table 16: ADEM geometric mean sampling data for Cowarts Creek

Station	Date	Flow cfs*	E. coli mpn/dl	Average Flow	›metric Mean Concentrat
CWTH-2	5/13/2021	263.8	770.1	156.3	249.6
CWTH-2	6/1/2021	125.5	93.4		
CWTH-2	6/2/2021	125.5	115.3		
CWTH-2	6/3/2021	115.8	104.3		
CWTH-2	6/8/2021	150.6	1119.9		
CWTH-2	8/9/2021	307.8	248.1	189.3	321.7
CWTH-2	8/11/2021	120.0	156.5		
CWTH-2	8/12/2021	107.1	613.1		
CWTH-2	8/18/2021	103.8	345		
CWTH-2	9/1/2021	307.8	419.6		
CWTH-4	6/1/2021	53.4	120.1	59.7	289.7
CWTH-4	6/2/2021	53.4	141.4		
CWTH-4	6/3/2021	49.3	101.7		
CWTH-4	6/8/2021	64.1	2419.6		
CWTH-4	6/10/2021	78.4	488.4		
CWTH-4	8/9/2021	51.1	275.5	80.2	723.2
CWTH-4	8/11/2021	45.6	461.1		
CWTH-4	8/12/2021	44.1	727		
CWTH-4	8/18/2021	130.9	689.6		
CWTH-4	9/1/2021	129.1	3106.2		

*Flows highlighted in yellow were estimated by taking the average daily flow from USGS Gauge 02358789 for the sampling date and multiplying by the ratio of the sampling station/gauge drainage area.

The violation events which resulted in the highest percent reduction were selected as the basis for the TMDLs. For Cowarts Creek, this violation occurred at station CWTH-4 on September 21, 2021 with an *E. coli* concentration of 3106.2 col/100ml and an estimated flow of 129.1 cfs. For Bruners Gin Creek, this violation occurred on September 9, 2015 at station BRGH-1, with an *E. coli* concentration of 1046.2 col/100 ml and an estimated flow of 1.9 cfs. For Rocky Creek, this violation occurred on August 1, 2018 at station RKYH-5, with an *E. coli* concentration of 1119.9 col/100 ml and a flow estimated at 5.3 cfs. For Cooper Creek, this violation occurred on May 1, 2017 at station COPH-2, with an *E. coli* concentration of 68,670 col/100 ml and a flow of 1.2 cfs. For Webb Creek, this violation occurred on August 1, 2018 at station WBCH-3, with an *E. coli* concentration of 648.8 col/100 ml and a flow measured at 2.8 cfs.

3.6 Critical Conditions/Seasonal Variation

Critical conditions typically occur during the summer months (May-October). This can be explained by the nature of storm events in the summer versus the winter. In summer, periods of dry weather interspersed with thunderstorms allow for the accumulation and washing off of bacteria into streams, resulting in spikes of bacteria counts. In winter, frequent low intensity rain events are more typical and do not allow for the build-up of bacteria on the land surface, resulting in a more uniform loading rate.

The waterbodies in the Cowarts Creek watershed generally follow the trends described above for the summer months of May through October. The critical conditions were taken to be those with the highest *E. coli* single sample exceedance values. Flows were either taken at the time of sample collection or estimated based on flows measured at USGS station 02358789 (Chipola River at Mariana, FL). The use of the highest exceedance to calculate the TMDL is expected to be protective of water quality in these waterbodies year-round.

3.7 Margin of Safety

There are two methods for incorporating a Margin of Safety (MOS) in the TMDL analysis: 1) by implicitly incorporating the MOS using conservative model assumptions to develop allocations, or 2) by explicitly specifying a portion of the TMDL as the MOS and using the remainder for allocations.

The MOS accounts for the uncertainty associated with the limited availability of data used in this analysis. An explicit MOS was applied to the TMDL by reducing the appropriate target criterion concentration by ten percent and calculating a mass loading target with measured or calculated flow data. The single sample *E. coli* maximum value of 298 colonies/100 ml was reduced by 10% to 268.2 colonies/100 ml, while the geometric mean criterion was reduced in the same fashion to 113.4 colonies/100 ml.

4.0 TMDL Development

4.1 Definition of a TMDL

A total maximum daily load (TMDL) is the sum of individual wasteload allocations for point sources (WLAs), load allocations (LAs) for nonpoint sources including natural background levels, and a margin of safety (MOS). The margin of safety can be included either explicitly or implicitly and accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. As discussed earlier, the MOS is explicit in this TMDL. A TMDL can be denoted by the equation:

$$TMDL = \Sigma \, WLAs + \Sigma \, LAs + MOS$$

The TMDL is the total amount of pollutant that can be assimilated by the receiving waterbody while achieving water quality standards under critical conditions.

For some pollutants, TMDLs are expressed on a mass loading basis (e.g., pounds per day). However, for pathogens, TMDL loads are typically expressed in terms of organism counts per day (colonies/day), in accordance with 40 CFR 130.2(i).

4.2 Load Calculations

A mass balance approach was used to calculate the *E. coli* TMDLs for the applicable waterbodies in the Cowarts Creek watershed. The mass balance approach utilizes the conservation of mass principle. Total mass loads can be calculated by multiplying the *E. coli* concentration times the instream flow times a conversion factor. Existing loads were calculated for the highest geometric mean exceedance and the highest single sample exceedance. In the same manner, allowable loads were calculated for the single sample criterion and the geometric mean criterion. There were both single sample and geometric mean violations; the TMDL was based on the violation that produced the highest calculated percent reduction to achieve applicable water quality criteria.

Existing Conditions

The **single sample** mass loading at each station was calculated by multiplying the highest *E. coli* single sample exceedance concentration by the flow from the day of the exceedance. The *E.coli* concentration times the flow and the conversion factor gives the total mass loading (colonies per day) of *E. coli* to these waterbodies under the single sample exceedance condition.

For Cowarts Creek:

$$\frac{129.1\ \text{ft}^3}{\text{s}} \times \frac{3106.2\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{9.81 \times 10^{12}\text{colonies}}{\text{day}}$$

For Bruners Gin Creek:

$$\frac{1.9\ \text{ft}^3}{\text{s}} \times \frac{1046.2\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{4.86 \times 10^{10}\text{colonies}}{\text{day}}$$

For Rocky Creek:

$$\frac{5.3\ \text{ft}^3}{\text{s}} \times \frac{1119.9\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.45 \times 10^{11}\text{colonies}}{\text{day}}$$

For Cooper Creek:

$$\frac{1.2\ \text{ft}^3}{\text{s}} \times \frac{68670\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.02 \times 10^{12}\text{colonies}}{\text{day}}$$

For Webb Creek:

$$\frac{2.8\ \mathrm{ft}^3}{\mathrm{s}} \times \frac{648.8\ \mathrm{colonies}}{100\ \mathrm{ml}} \times \frac{24{,}465{,}755 * 100\ \mathrm{ml} * \mathrm{s}}{\mathrm{ft}^3 * \mathrm{day}} = \frac{4.44 \times 10^{10}\mathrm{colonies}}{\mathrm{day}}$$

The **continuous point sources** mass loading was calculated by taking the average discharge flow from the month of September 2021 (since this is when the highest exceedance on Cowarts Creek occurred) and multiplying that by the reported maximum daily *E. coli* value for the same month for the facility. These numbers were found in the September 2021 Discharge Monitoring Report (DMR) submitted by the facility.

For Ashford WWTP (AL0057878):

$$0.631\ MGD * \frac{1.55\ \mathrm{ft}^3}{\mathrm{s} * \mathrm{MGD}} \times \frac{7\ \mathrm{colonies}}{100\ \mathrm{ml}} \times \frac{24{,}465{,}755 * 100\ \mathrm{ml} * \mathrm{s}}{\mathrm{ft}^3 * \mathrm{day}} = \frac{1.68 \times 10^{8}\mathrm{colonies}}{\mathrm{day}}$$

The **geometric mean** mass loading was calculated by multiplying the highest geometric mean exceedance by the average of the flows taken during the sampling event. The *E.coli* concentration times the flow and the conversion factor gives the total mass loading (colonies per day) of *E. coli* to these waterbodies under the geometric mean exceedance condition.

For Cowarts Creek:

$$\frac{80.2\ \mathrm{ft}^3}{\mathrm{s}} \times \frac{723.2\ \mathrm{colonies}}{100\ \mathrm{ml}} \times \frac{24{,}465{,}755 * 100\ \mathrm{ml} * \mathrm{s}}{\mathrm{ft}^3 * \mathrm{day}} = \frac{1.42 \times 10^{12}\mathrm{colonies}}{\mathrm{day}}$$

Allowable Conditions

The **allowable load** for each station was calculated under the same physical conditions as discussed above for the single sample and geometric mean criteria. This was done by taking the product of the flow and the allowable concentration. This value was then multiplied by the conversion factor to calculate the allowable load.

For the **single sample** *E. coli* target concentration of 268.2 colonies/100 ml, the allowable *E. coli* loadings are shown below.

For Cowarts Creek:

$$\frac{129.1\ \mathrm{ft}^3}{\mathrm{s}} \times \frac{268.2\ \mathrm{colonies}}{100\ \mathrm{ml}} \times \frac{24{,}465{,}755 * 100\ \mathrm{ml} * \mathrm{s}}{\mathrm{ft}^3 * \mathrm{day}} = \frac{8.47 \times 10^{11}\mathrm{colonies}}{\mathrm{day}}$$

For Bruners Gin Creek:

$$\frac{1.9\ \mathrm{ft}^3}{\mathrm{s}} \times \frac{268.2\ \mathrm{colonies}}{100\ \mathrm{ml}} \times \frac{24{,}465{,}755 * 100\ \mathrm{ml} * \mathrm{s}}{\mathrm{ft}^3 * \mathrm{day}} = \frac{1.25 \times 10^{10}\mathrm{colonies}}{\mathrm{day}}$$

For Rocky Creek:

$$\frac{5.3\ \text{ft}^3}{\text{s}} \times \frac{268.2\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{3.48 \times 10^{10}\text{colonies}}{\text{day}}$$

For Cooper Creek:

$$\frac{1.2\ \text{ft}^3}{\text{s}} \times \frac{268.2\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{7.87 \times 10^{9}\text{colonies}}{\text{day}}$$

For Webb Creek:

$$\frac{2.8\ \text{ft}^3}{\text{s}} \times \frac{268.2\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.84 \times 10^{10}\text{colonies}}{\text{day}}$$

The continuous point source allowable loading was calculated by multiplying the design flow of the Ashford WWTP by the *E. coli* daily maximum permit limitation of 298 colonies/100 ml. This value was then multiplied by a conversion factor to come up with the appropriate loading.

For Ashford WWTP (AL0057878):

$$0.35\ MGD * \frac{1.55\ \text{ft}^3}{\text{s} * \text{MGD}} \times \frac{298\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{3.96 \times 10^{9}\text{colonies}}{\text{day}}$$

The explicit margin of safety of 29.8 colonies/100 ml for single samples equals a daily loading of:

For Cowarts Creek:

$$\frac{129.1\ \text{ft}^3}{\text{s}} \times \frac{29.8\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{9.41 \times 10^{10}\text{colonies}}{\text{day}}$$

For Bruners Gin Creek:

$$\frac{1.9\ \text{ft}^3}{\text{s}} \times \frac{29.8\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{1.39 \times 10^{9}\text{colonies}}{\text{day}}$$

For Rocky Creek:

$$\frac{5.3\ \text{ft}^3}{\text{s}} \times \frac{29.8\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{3.86 \times 10^{9}\text{colonies}}{\text{day}}$$

For Cooper Creek:

$$\frac{1.2\ \text{ft}^3}{\text{s}} \times \frac{29.8\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{8.75\ \times 10^8 \text{colonies}}{\text{day}}$$

For Webb Creek:

$$\frac{2.8\ \text{ft}^3}{\text{s}} \times \frac{29.8\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.04\ \times 10^9 \text{colonies}}{\text{day}}$$

For the **geometric mean** *E. coli* target concentration of 113.4 colonies/100 ml, the allowable *E. coli* loading is shown below.

For Cowarts Creek:

$$\frac{80.2\ \text{ft}^3}{\text{s}} \times \frac{113.4\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.22 \times 10^{11} \text{colonies}}{\text{day}}$$

The explicit margin of safety of 12.6 colonies/100 ml for the geometric mean equals a daily loading of:

For Cowarts Creek:

$$\frac{80.2\ \text{ft}^3}{\text{s}} \times \frac{12.6\ \text{colonies}}{100\ \text{ml}} \times \frac{24{,}465{,}755 * 100\ \text{ml} * \text{s}}{\text{ft}^3 * \text{day}} = \frac{2.47 \times 10^{10} \text{colonies}}{\text{day}}$$

The difference in the pathogen loading between the existing condition (violation event) and the allowable condition converted to a percent reduction represents the total load reduction needed to achieve the *E. coli* water quality criteria. The TMDLs were calculated as the total daily *E. coli* loads to each applicable waterbody. Tables 17-21 show the *E. coli* loads and required reductions for the Cowarts Creek watershed.

Table 17: *E. coli* Loads and Required Reductions for Cowarts Creek

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	9.81E+12	8.47E+11	8.96E+12	91%
Geometric Mean Load	1.42E+12	2.22E+11	1.20E+12	84%
Ashford WWTP	1.68E+8	3.96E+9	0	0%

Table 18: *E. coli* Loads and Required Reductions for Bruners Gin Creek

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	4.86E+10	1.25E+10	3.62E+10	74%

Table 19: *E. coli* Loads and Required Reductions for Rocky Creek

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	1.45E+11	3.48E+10	1.10E+11	76%

Table 20: *E. coli* Loads and Required Reductions for Cooper Creek

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	2.02E+12	7.87E+9	2.01E+12	100%

Table 21: *E. coli* Loads and Required Reductions for Webb Creek

Source	Existing Load (colonies/day)	Allowable Load (colonies/day)	Required Reduction (colonies/day)	% Reduction
Single Sample Load	4.44E+10	1.84E+10	2.61E+10	59%

From the tables above, compliance with the single sample *E. coli* maximum criterion of 298 colonies/100 ml requires a reduction in the *E. coli* load of 91% for Cowarts Creek, 74% for Bruners Gin Creek, 76% for Rocky Creek, 100% for Cooper Creek, and 59% for Webb Creek. The TMDL, WLA, LA and MOS values necessary to achieve the applicable *E. coli* criterion are provided in the tables below.

Table 22: *E. coli* TMDL for Cowarts Creek

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
9.41E+11	9.41E+10	3.96E+9	91%	0	8.43E+11	91%

a. Current and future CAFOs will be assigned a wasteload allocation (WLA) of zero.
b. Current and future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. MS4 permits are BMP-based and currently do not specify numeric *E. coli* limits. TMDL compliance will be demonstrated through implementation and maintenance of BMPs. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.
e. TMDL was established using the single sample *E. coli* criterion of 298 colonies/100ml.

Table 23: *E. coli* TMDL for Bruners Gin Creek

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
1.39E+10	1.39E+9	0	0%	0	1.25E+10	74%

a. Current and future CAFOs will be assigned a wasteload allocation (WLA) of zero.
b. Current and future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. MS4 permits are BMP-based and currently do not specify numeric *E. coli* limits. TMDL compliance will be demonstrated through implementation and maintenance of BMPs. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.
e. TMDL was established using the single sample *E. coli* criterion of 298 colonies/100ml.

Table 24: *E. coli* TMDL for Rocky Creek

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
3.86E+10	3.86E+9	0	0%	0	3.48E+10	76%

a. Current and future CAFOs will be assigned a wasteload allocation (WLA) of zero.
b. Current and future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. MS4 permits are BMP-based and currently do not specify numeric *E. coli* limits. TMDL compliance will be demonstrated through implementation and maintenance of BMPs. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.
e. TMDL was established using the single sample *E. coli* criterion of 298 colonies/100ml.

Table 25: *E. coli* TMDL for Cooper Creek

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
8.75E+9	8.75E+8	0	100%	0	7.87E+9	100%

a. Current and future CAFOs will be assigned a wasteload allocation (WLA) of zero.
b. Current and future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. MS4 permits are BMP-based and currently do not specify numeric *E. coli* limits. TMDL compliance will be demonstrated through implementation and maintenance of BMPs. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.
e. TMDL was established using the single sample *E. coli* criterion of 298 colonies/100ml.

Table 26: *E. coli* TMDL for Webb Creek

TMDL[e]	Margin of Safety (MOS)	Waste Load Allocation (WLA)[a]			Load Allocation (LA)	
		WWTPs[b]	MS4s[c]	Leaking Collection Systems[d]		
(col/day)	(col/day)	(col/day)	% reduction	(col/day)	(col/day)	% reduction
2.04E+10	2.04E+9	0	0%	0	1.84E+10	59%

a. Current and future CAFOs will be assigned a wasteload allocation (WLA) of zero.
b. Current and future WWTPs must meet the applicable in-stream water quality criteria for pathogens at the point of discharge.
c. MS4 permits are BMP-based and currently do not specify numeric *E. coli* limits. TMDL compliance will be demonstrated through implementation and maintenance of BMPs. Future MS4 areas would be required to demonstrate consistency with the assumptions and requirements of this TMDL.
d. The objective for leaking collection systems is a WLA of zero. It is recognized, however, that a WLA of 0 colonies/day may not be practical. For these sources, the WLA is interpreted to mean a reduction in *E. coli* loading to the maximum extent practicable, consistent with the requirement that these sources not contribute to a violation of the water quality criteria for *E. coli*.
e. TMDL was established using the single sample *E. coli* criterion of 298 colonies/100ml.

4.3 TMDL Summary

The §303(d) listing for Cowarts Creek was originally reported on Alabama's 2016 List of Impaired Waters based on data collected in 2014. The §303(d) listing for Bruners Gin Creek was originally reported on Alabama's 2018 List of Impaired Waters based on data collected in 2015. The §303(d) listings for Rocky Creek and Webb Creek were originally reported on Alabama's 2020 List of Impaired Waters based on data collected in 2018. The §303(d) listing for Cooper Creek was originally reported on Alabama's 2020 List of Impaired Waters based on data collected in 2017.

Between 2015 and 2022, ADEM collected water quality data for the Cowarts Creek watershed at seven stations on the impaired segments. This data provided the basis for TMDL development.

A mass balance approach was used to calculate the *E. coli* TMDL for the applicable waterbodies in the Cowarts Creek watershed. Required reductions are 91% for Cowarts Creek, 74% for Bruners Gin Creek, 76% for Rocky Creek, 100% for Cooper Creek, and 59% for Webb Creek.

Compliance with the terms and conditions of existing and future NPDES sanitary and storm water permits will effectively implement the WLA and demonstrate consistency with the assumptions and requirements of the TMDL.

Required load reductions in the LA portion of this TMDL will be implemented through voluntary measures/best management practices (BMPs). Cooperation and active participation by the general public and various other groups is critical to successful implementation of TMDLs. Local citizen-led and implemented management measures offer the most efficient and comprehensive avenue for reduction of loading rates from nonpoint sources. Therefore, TMDL implementation activities for nonpoint sources will be coordinated through interaction with local entities and may be eligible for CWA §319 grants through the Department's Nonpoint Source Unit.

The Department recognizes that adaptive implementation of this TMDL will be needed to achieve applicable water quality criteria, and we are committed to targeting the load reductions to improve water quality in the Cowarts Creek watershed. As additional data and/or information become available, it may become necessary to revise and/or modify the TMDL accordingly.

5.0 Follow-up Monitoring

ADEM has adopted a basin approach to water quality monitoring; an approach that divides Alabama's sixteen major river basins into three groups. Each year, ADEM's water quality resources are concentrated in one of the three basin groups and are divided among multiple priorities including §303(d) listed waterbodies, waterbodies with active TMDLs, and other waterbodies as determined by the Department. Monitoring will help further characterize water quality conditions resulting from the implementation of best management practices and load reductions in the watershed. This monitoring will occur in each basin according the schedule shown in Table 28.

Table 27: Follow-up Monitoring Schedule

River Basin Group	Years to be Monitored
Alabama, Cahaba, Mobile, Tallapoosa, Tennessee (Pickwick and Wilson)	2023/2026
Black Warrior, Blackwater, Chattahoochee, Chipola, Choctawhatchee, Escambia, Perdido, Tennessee (Wheeler), Yellow	2024/2027
Coosa, Escatawpa, Tennessee (Guntersville), Tombigbee	2025/2028

6.0 Public Participation

As part of the public participation process, this TMDL was placed on public notice and made available for review and comment. The public notice was prepared and published in four major newspapers in Montgomery, Huntsville, Birmingham, and Mobile, as well as submitted to persons who requested to be on ADEM's postal and electronic mailing distributions. In addition, the public notice and subject TMDL were made available on ADEM's website: www.adem.alabama.gov. The public could also request paper or electronic copies of the TMDL by contacting Ms. Kimberly Minton at 334-271-7826 or kminton@adem.alabama.gov. The public was given an opportunity to review the TMDL and submit comments to the Department in writing. No written comments were received during the public notice period.

7.0 Appendices

7.1 References

ADEM Administrative Code, 2021. Water Division - Water Quality Program, Chapter 335-6-10, Water Quality Criteria.

ADEM Administrative Code, 2021. Water Division - Water Quality Program, Chapter 335-6-11, Use Classifications for Interstate and Intrastate Waters.

Alabama's Monitoring Program. 2014, 2015, 2017, 2018, 2021, 2022. ADEM.

Alabama Department of Environmental Management (ADEM), *Alabama's Water Quality Assessment and Listing Methodology*, January 2022.

Alabama Department of Environmental Management, 2016, 2018, 2020, 2022 §303(d) Lists and Fact Sheets. ADEM.

Alabama Department of Environmental Management (ADEM) Laboratory Data Qualification SOP#4910 Revision 6.2, May 2021.

United States Environmental Protection Agency, 1991. Guidance for Water Quality-Based Decisions: The TMDL Process. Office of Water. EPA 440/4-91-001.

United States Environmental Protection Agency, 1986. Quality Criteria for Water. Office of Water. EPA 440/4-91-001.

7.2 §303(d) Listing Data

Station	Waterbody Name	Date	E. coli mpn/dl	
CWTH-4	Cowarts Ck	3/26/2014	112.6	H
CWTH-4	Cowarts Ck	4/16/2014	2419.6	GH
CWTH-4	Cowarts Ck	5/13/2014	1540.2	H
CWTH-4	Cowarts Ck	6/11/2014	581.8	H
CWTH-4	Cowarts Ck	7/16/2014	114.5	H
CWTH-4	Cowarts Ck	8/13/2014	209.8	H
CWTH-4	Cowarts Ck	9/17/2014	866.4	H
CWTH-4	Cowarts Ck	10/15/2014	2419.6	GH
CWTH-5	Cowarts Ck	3/26/2014	98.5	H
CWTH-5	Cowarts Ck	4/16/2014	2419.6	GH
CWTH-5	Cowarts Ck	5/13/2014	3106.2	H
CWTH-5	Cowarts Ck	6/11/2014	1454	H
CWTH-5	Cowarts Ck	7/16/2014	172.3	H
CWTH-5	Cowarts Ck	8/13/2014	325.5	H
CWTH-5	Cowarts Ck	9/17/2014	228.2	H
CWTH-5	Cowarts Ck	10/15/2014	2419.6	GH
CWTH-6	Cowarts Ck	3/26/2014	300	H
CWTH-6	Cowarts Ck	4/16/2014	2419.6	GH
CWTH-6	Cowarts Ck	5/13/2014	3106.2	H
CWTH-6	Cowarts Ck	6/11/2014	1540.2	H
CWTH-6	Cowarts Ck	7/16/2014	141.4	H
CWTH-6	Cowarts Ck	8/13/2014	1046.2	H
CWTH-6	Cowarts Ck	9/17/2014	325.5	H
CWTH-6	Cowarts Ck	10/15/2014	2419.6	GH
COPH-2	Cooper Ck	3/15/2017	2419.6	GH
COPH-2	Cooper Ck	4/11/2017	127.4	H
COPH-2	Cooper Ck	5/1/2017	68670	H
COPH-2	Cooper Ck	6/7/2017	64880	H
COPH-2	Cooper Ck	7/5/2017	4839.2	GH
COPH-2	Cooper Ck	8/16/2017	32550	H
COPH-2	Cooper Ck	9/13/2017	20982	H
COPH-2	Cooper Ck	10/10/2017	20142	H

Station	Waterbody Name	Date	E. coli mpn/dl	
RKYH-5	Rocky Ck	3/6/2018	2419.6	GH
RKYH-5	Rocky Ck	4/9/2018	197.3	H
RKYH-5	Rocky Ck	5/15/2018	156.5	H
RKYH-5	Rocky Ck	6/5/2018	435.2	H
RKYH-5	Rocky Ck	7/11/2018	172.5	
RKYH-5	Rocky Ck	8/1/2018	1119.9	H
RKYH-5	Rocky Ck	9/5/2018	216.2	
RKYH-5	Rocky Ck	10/9/2018	172.2	
BRGH-1	Bruners Gin Ck	3/19/2015	365.4	
BRGH-1	Bruners Gin Ck	4/9/2015	172.3	
BRGH-1	Bruners Gin Ck	5/6/2015	90.9	
BRGH-1	Bruners Gin Ck	6/11/2015	131.4	
BRGH-1	Bruners Gin Ck	7/1/2015	435.2	
BRGH-1	Bruners Gin Ck	8/6/2015	547.5	
BRGH-1	Bruners Gin Ck	9/9/2015	1046.2	
BRGH-1	Bruners Gin Ck	10/7/2015	275.5	
RKYH-5	Rocky Ck	3/6/2018	2419.6	GH
RKYH-5	Rocky Ck	4/9/2018	197.3	H
RKYH-5	Rocky Ck	5/15/2018	156.5	H
RKYH-5	Rocky Ck	6/5/2018	435.2	H
RKYH-5	Rocky Ck	7/11/2018	172.5	
RKYH-5	Rocky Ck	8/1/2018	1119.9	H
RKYH-5	Rocky Ck	9/5/2018	216.2	
RKYH-5	Rocky Ck	10/9/2018	172.2	

*G indicates that the actual number was probably greater than the number reported. H indicates that the analytical holding times for analysis were exceeded.

7.3 SSO Summary

SSO Summary Report

Start	Stop	Duration	Location	Volume	Public Notice	CHD Notice	24 Hour Notice
11/1/2022 2:00 P	11/1/2022 4:15 P	2Hrs 15Mins	Manhole next to wastewater treatment plant lift station.	25,000 < gallons < = 50,000	Radio station.: 11/1/2022	11/1/2022	
3/18/2022 2:00 P	3/21/2022 7:30 A	65Hrs 30Mins	Ashford WWTP lift station manhole.	100000 gallons	Radio announcement.: 3/18/2022	3/18/2022	3/19/2022 11:05 A
9/1/2021 5:00 A	9/1/2021 12:00 P	7Hrs 0Mins	31.175196/ -85.242096	25,000 < gallons < =50,000	Radio: 9/1/2021	9/1/2021	9/1/2021 8:00 A
8/17/2021 4:00 A	8/18/2021 10:00 A	30Hrs 0Mins	31.175196/ -85.242092	50,000 < gallons < =75,000	Radio: 8/17/2021	8/17/2021	8/17/2021 8:40 A
7/1/2021 8:30 A	7/1/2021 2:30 P	6Hrs 0Mins	31.175180/ -85.242041	25,000 < gallons < =50,000	Radio: 7/1/2021	7/1/2021	7/1/2021 11:00 A
4/24/2021 8:45 A	4/24/2021 7:00 P	10Hrs 15Mins	Treatment plant lift station.	10,000 < gallons < = 25,000	Radio: 4/24/2021	4/24/2021	4/24/2021 9:10 A
3/23/2021 12:00 P	3/23/2021 4:45 P	4Hrs 45Mins	465 South County Road 33, Ashford, AL 36312	10,000 < gallons < = 25,000	Radio: 3/23/2021	3/23/2021	3/23/2021 12:55 P
3/3/2021 8:00 A	3/4/2021 2:30 P	30Hrs 30Mins	31.175184/ -85.242047	10,000 < gallons < = 25,000	Radio: 3/3/2021	3/3/2021	3/3/2021 8:25 A
2/18/2021 9:00 A	2/22/2021 10:00 A	97Hrs 0Mins	31.175184/ -85.242047	10,000 < gallons < = 25,000	Radio: 2/18/2021	2/18/2021	2/18/2021 12:20 A
2/18/2021 1:00 P	2/22/2021 12:00 P	95Hrs 0Mins	102 5th Ave, Ashford, AL 36312	1,000 < gallons < =10,000	Radio: 2/19/2021	2/19/2021	2/19/2021 12:00 P
2/18/2021 1:00 P	2/22/2021 8:00 A	91Hrs 0Mins	31.183512/ -85.234993	25,000 < gallons < =50,000	Radio: 2/19/2021	2/19/2021	2/19/2021 12:00 A
2/16/2021 9:00 A	2/17/2021 6:00 A	21Hrs 0Mins	31.175184/ -85.242047	25,000 < gallons < =50,000	Radio: 2/16/2021	2/16/2021	2/16/2021 11:05 A
2/13/2021 12:00 P	2/15/2021 9:00 A	45Hrs 0Mins	31.175184/ -85.242047	50,000 < gallons < =75,000	Radio: 2/13/2021	2/13/2021	2/13/2021 12:25 P

7.4 Station Photographs

Station CWTH-4, Looking Upstream

Station CWTH-6, Looking Upstream

Station BRGH-1, Looking Upstream

Station RKYH-5, Looking Upstream

Station COPH-2, Looking Upstream

Station WBCH-3, Looking Upstream